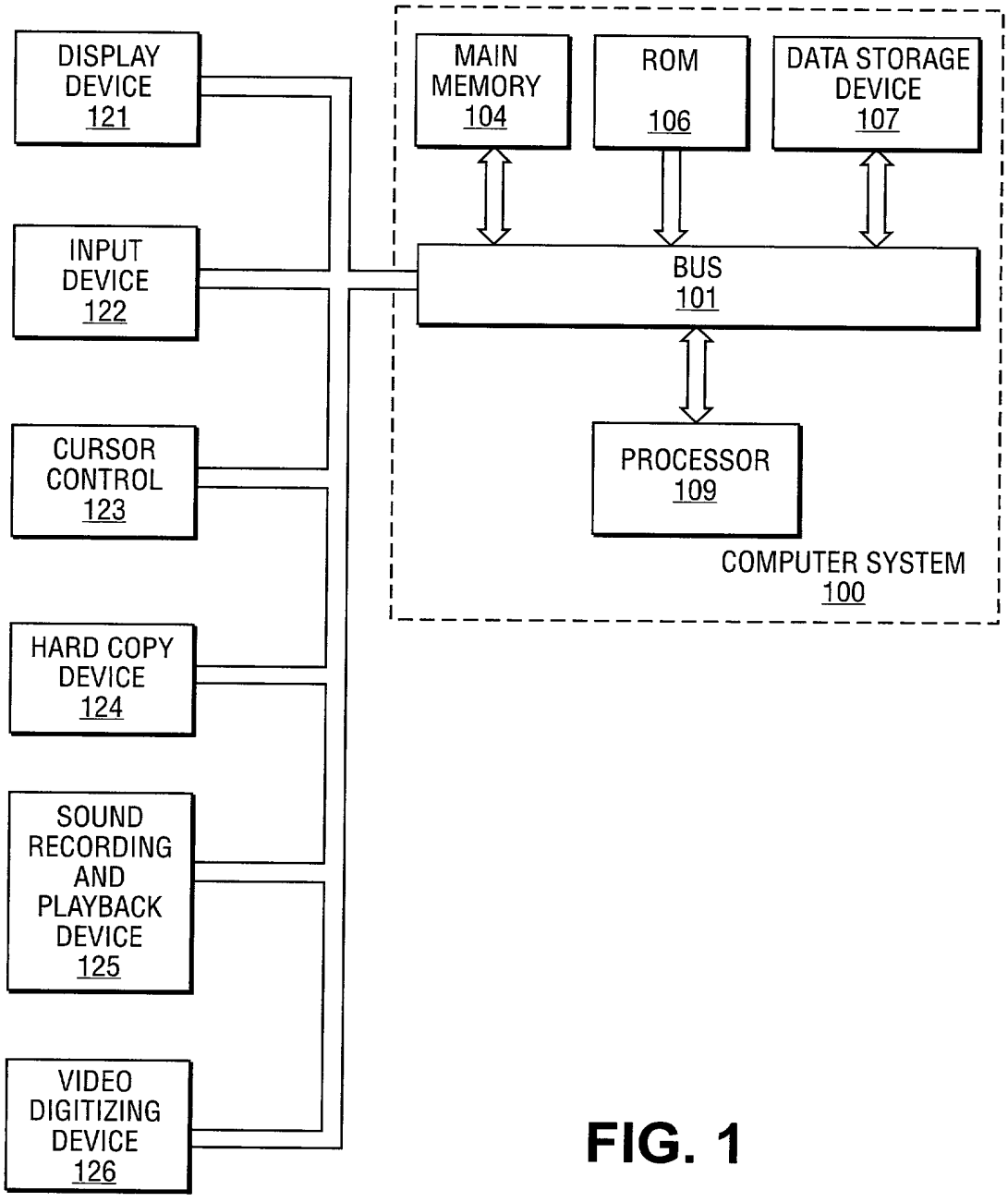
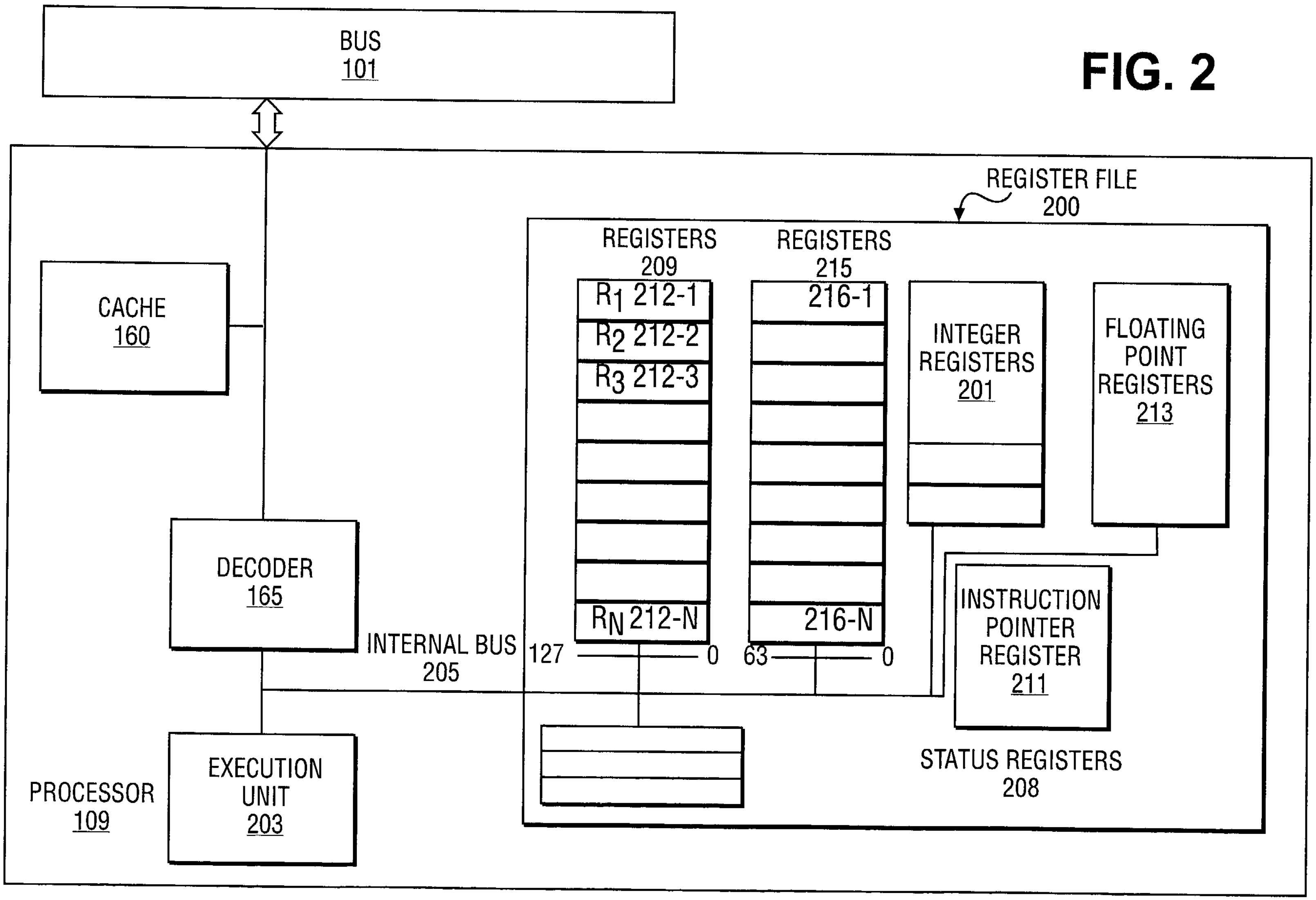

DISPLAY DEVICE 121
INPUT DEVICE 122
CURSOR CONTROL 123
HARD COPY DEVICE 124
SOUND RECORDING AND PLAYBACK DEVICE 125
VIDEO DIGITIZING DEVICE 126
MAIN MEMORY 104
ROM 106
DATA STORAGE DEVICE 107
BUS 101
PROCESSOR 109
COMPUTER SYSTEM 100

FIG. 1

FIG. 2



BUS
101
REGISTER FILE
200
REGISTERS
209
REGISTERS
215
R1 212-1
R2 212-2
R3 212-3
RN 212-N
216-1
216-N
127
0
63
0
CACHE
160
INTEGER
REGISTERS
201
FLOATING
POINT
REGISTERS
213
DECODER
165
INTERNAL BUS
205
INSTRUCTION
POINTER
REGISTER
211
STATUS REGISTERS
208
PROCESSOR
109
EXECUTION
UNIT
203

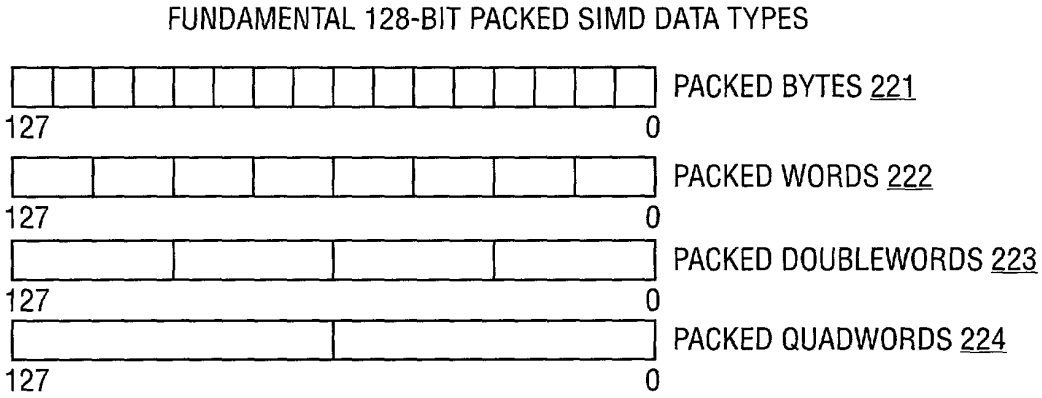

FUNDAMENTAL 128-BIT PACKED SIMD DATA TYPES
PACKED BYTES 221
127
0
PACKED WORDS 222
127
0
PACKED DOUBLEWORDS 223
127
0
PACKED QUADWORDS 224
127
0

FIG. 3A

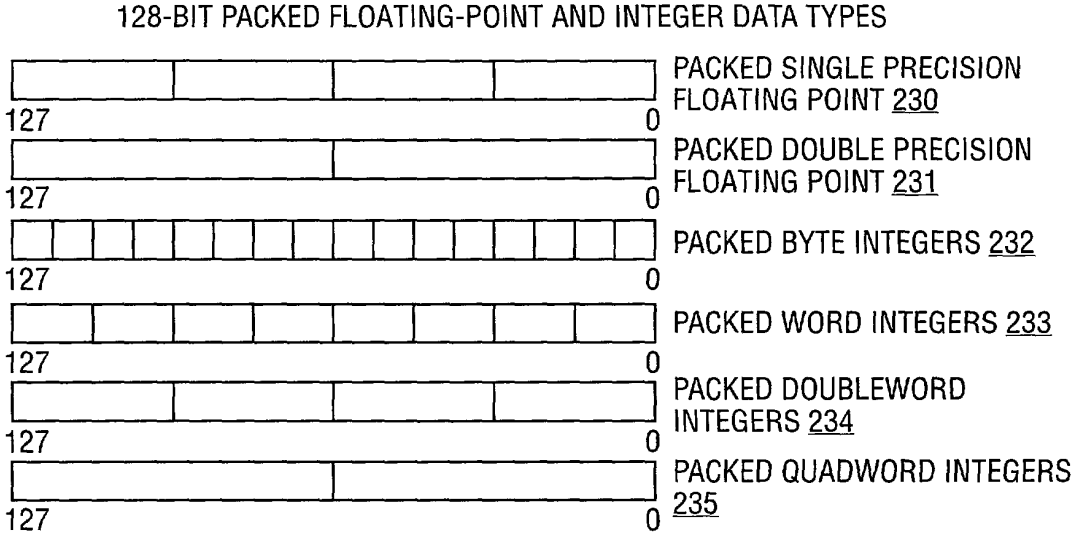

128-BIT PACKED FLOATING-POINT AND INTEGER DATA TYPES
PACKED SINGLE PRECISION FLOATING POINT 230
127
0
PACKED DOUBLE PRECISION FLOATING POINT 231
127
0
PACKED BYTE INTEGERS 232
127
0
PACKED WORD INTEGERS 233
127
0
PACKED DOUBLEWORD INTEGERS 234
127
0
PACKED QUADWORD INTEGERS 235
127
0

FIG. 3B

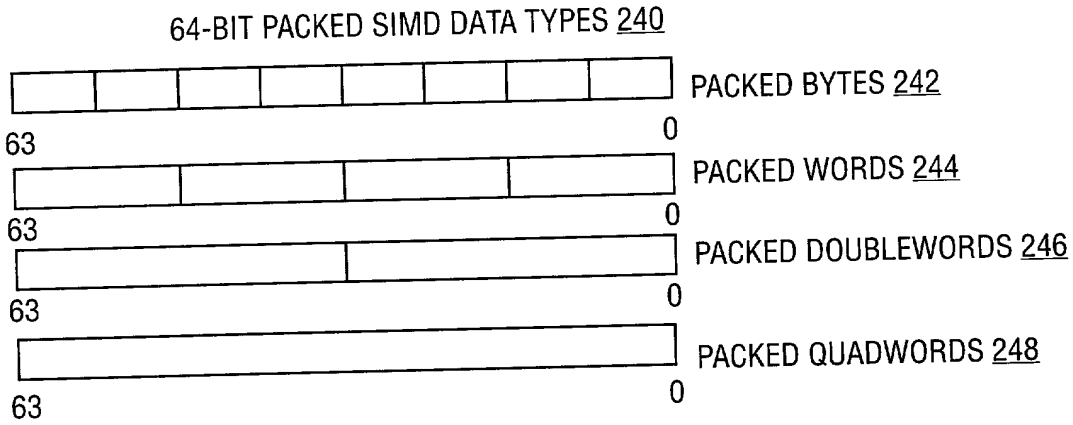

64-BIT PACKED SIMD DATA TYPES 240
PACKED BYTES 242
63
0
PACKED WORDS 244
63
0
PACKED DOUBLEWORDS 246
63
0
PACKED QUADWORDS 248
63
0

FIG. 3C

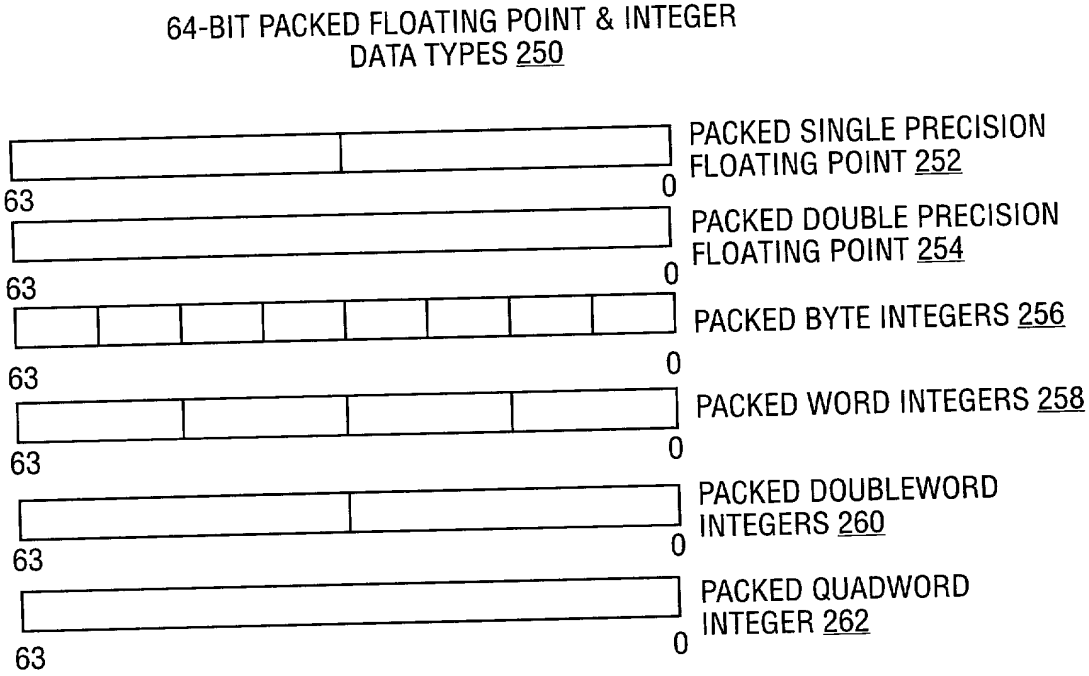

64-BIT PACKED FLOATING POINT & INTEGER
DATA TYPES 250
PACKED SINGLE PRECISION
FLOATING POINT 252
63
0
PACKED DOUBLE PRECISION
FLOATING POINT 254
63
0
PACKED BYTE INTEGERS 256
63
0
PACKED WORD INTEGERS 258
63
0
PACKED DOUBLEWORD
INTEGERS 260
63
0
PACKED QUADWORD
INTEGER 262
63
0

FIG. 3D

$$S=\begin{bmatrix} S_{11} & S_{12} & S_{13} & S_{14} \\ S_{21} & S_{22} & S_{23} & S_{24} \\ S_{31} & S_{32} & S_{33} & S_{34} \\ S_{41} & S_{42} & S_{43} & S_{44} \end{bmatrix} = \left[\begin{array}{c|c} A & B \\ \hline C & D \end{array}\right]$$

SOURCE MATRIX 300

FIG. 4A MATRIX SUBDIVISION

$$A=\begin{bmatrix} S_{11} & S_{12} \\ S_{21} & S_{22} \end{bmatrix} = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$$

SUB-MATRIX A - 310

$$B=\begin{bmatrix} S_{13} & S_{14} \\ S_{23} & S_{24} \end{bmatrix} = \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix}$$

SUB-MATRIX C - 320

$$C=\begin{bmatrix} S_{31} & S_{32} \\ S_{41} & S_{42} \end{bmatrix} = \begin{bmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{bmatrix}$$

SUB-MATRIX C - 330

$$D=\begin{bmatrix} S_{33} & S_{34} \\ S_{43} & S_{44} \end{bmatrix} = \begin{bmatrix} D_{11} & D_{12} \\ D_{21} & D_{22} \end{bmatrix}$$

SUB-MATRIX D - 340

FIG. 4B

312 $A.V_1 = [A_{11}, A_{12}]$
314 $A.V_2 = [A_{21}, A_{22}]$
SUB-MATRIX A ROWS

322 $B.V_1 = [B_{11}, B_{12}]$
324 $B.V_2 = [B_{21}, B_{22}]$
SUB-MATRIX B ROWS

332 $C.V_1 = [C_{11}, C_{12}]$
334 $C.V_2 = [C_{21}, C_{22}]$
SUB-MATRIX C ROWS

342 $D.V_1 = [D_{11}, D_{12}]$
344 $D.V_2 = [D_{21}, D_{22}]$
SUB-MATRIX D ROWS

FIG. 4C SUB-MATRIX ROW REPRESENTATION

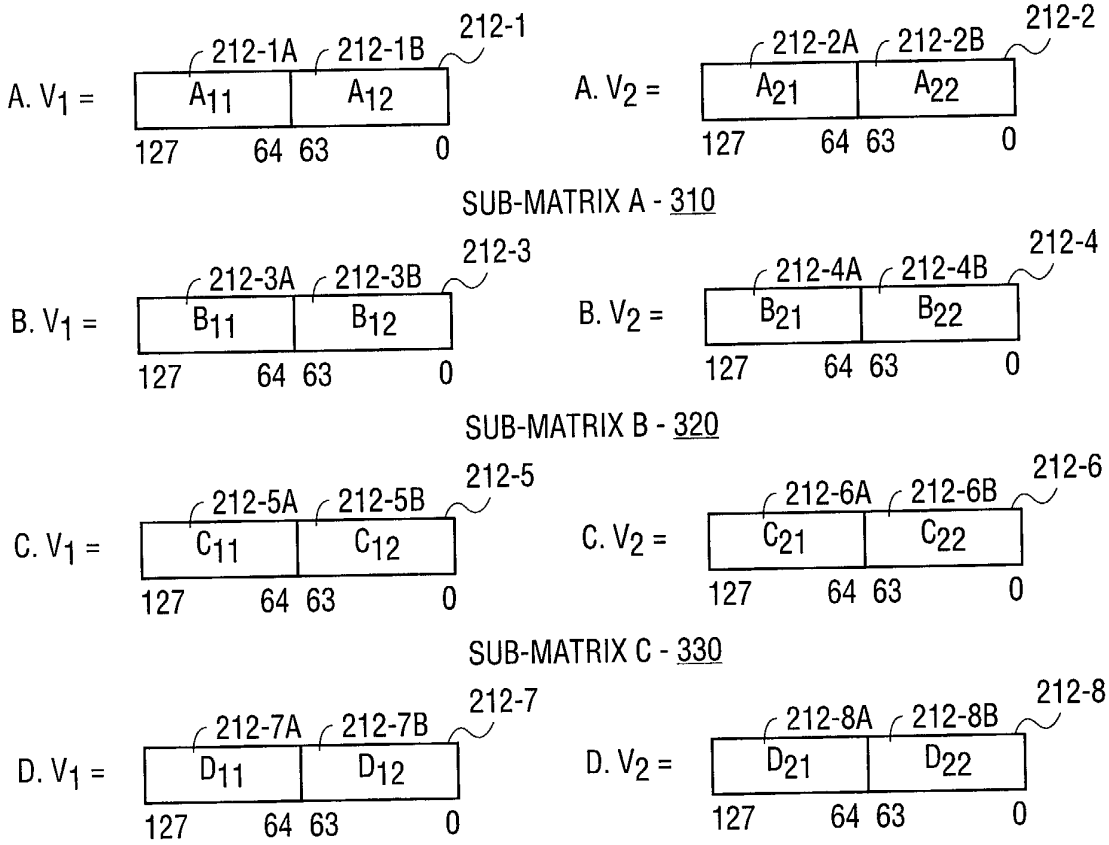

A. V_1 =
212-1
212-1A
212-1B
A_{11}
A_{12}
127 64 63 0
A. V_2 =
212-2
212-2A
212-2B
A_{21}
A_{22}
127 64 63 0
SUB-MATRIX A - 310
B. V_1 =
212-3
212-3A
212-3B
B_{11}
B_{12}
127 64 63 0
B. V_2 =
212-4
212-4A
212-4B
B_{21}
B_{22}
127 64 63 0
SUB-MATRIX B - 320
C. V_1 =
212-5
212-5A
212-5B
C_{11}
C_{12}
127 64 63 0
C. V_2 =
212-6
212-6A
212-6B
C_{21}
C_{22}
127 64 63 0
SUB-MATRIX C - 330
D. V_1 =
212-7
212-7A
212-7B
D_{11}
D_{12}
127 64 63 0
D. V_2 =
212-8
212-8A
212-8B
D_{21}
D_{22}
127 64 63 0
SUB-MATRIX D - 340
REGISTER REPRESENTATION

FIG. 4D

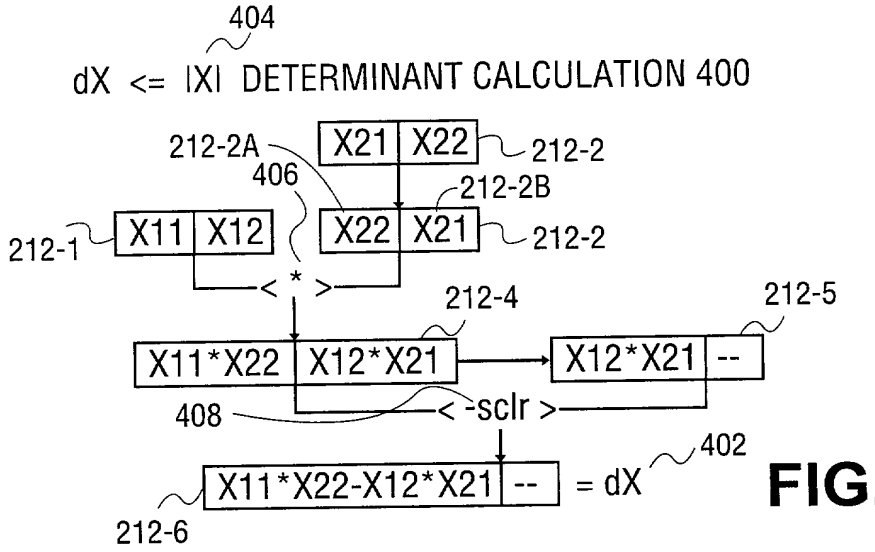

404
dX <= IXI DETERMINANT CALCULATION 400
212-2A
X21 X22
212-2
406
212-2B
212-1
X11 X12
X22 X21
212-2
< * >
212-4
212-5
X11*X22 X12*X21
X12*X21 --
408
< -sclr >
402
X11*X22-X12*X21 -- = dX
212-6

FIG. 5

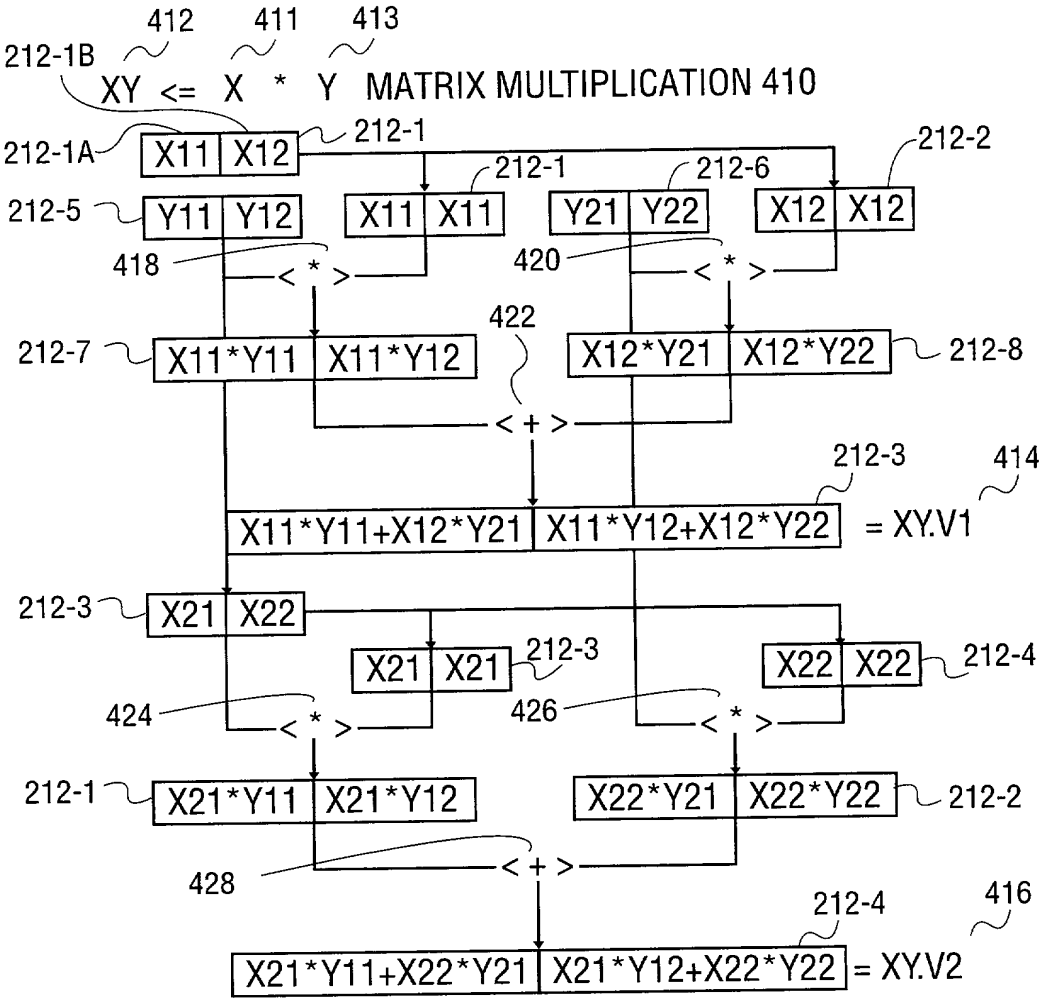

412
411
413
212-1B
XY <= X * Y MATRIX MULTIPLICATION 410
212-1A
X11 X12
212-1
212-2
212-1
212-6
212-5
Y11 Y12
X11 X11
Y21 Y22
X12 X12
418
< * >
420
< * >
422
212-7
X11*Y11 X11*Y12
X12*Y21 X12*Y22
212-8
< + >
212-3
414
X11*Y11+X12*Y21 X11*Y12+X12*Y22 = XY.V1
212-3
X21 X22
X21 X21
212-3
X22 X22
212-4
424
< * >
426
< * >
212-1
X21*Y11 X21*Y12
X22*Y21 X22*Y22
212-2
428
< + >
212-4
416
X21*Y11+X22*Y21 X21*Y12+X22*Y22 = XY.V2

FIG. 6

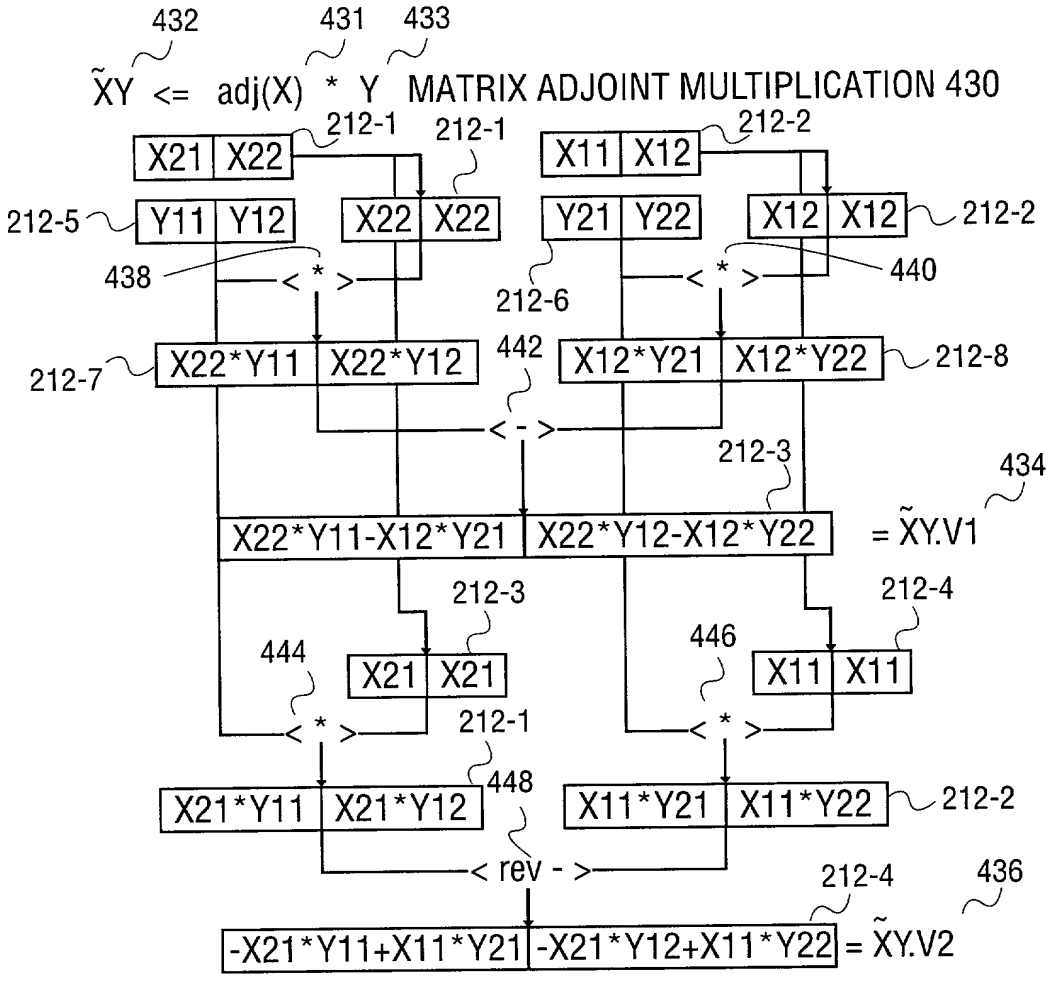

432
431
433
X̃Y <= adj(X) * Y MATRIX ADJOINT MULTIPLICATION 430
212-1
212-1
212-2
X21 X22
X11 X12
212-5
Y11 Y12
X22 X22
Y21 Y22
X12 X12
212-2
438
< * >
212-6
< * >
440
212-7
X22*Y11 X22*Y12
442
X12*Y21 X12*Y22
212-8
< - >
212-3
434
X22*Y11-X12*Y21 X22*Y12-X12*Y22
= X̃Y.V1
212-3
212-4
444
446
X21 X21
X11 X11
< * >
212-1
< * >
448
X21*Y11 X21*Y12
X11*Y21 X11*Y22
212-2
< rev - >
212-4
436
-X21*Y11+X11*Y21 -X21*Y12+X11*Y22
= X̃Y.V2

FIG. 7

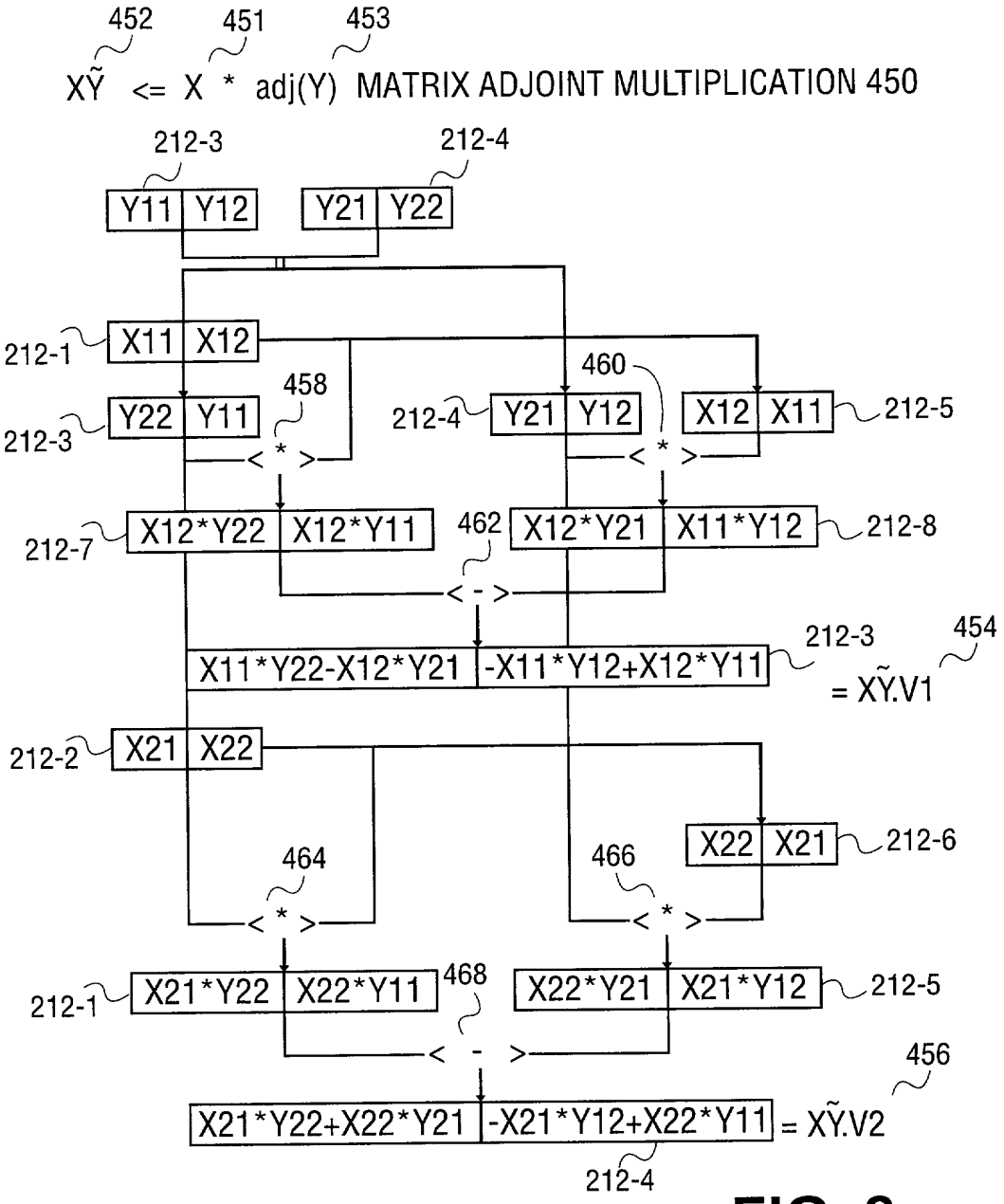


FIG. 8

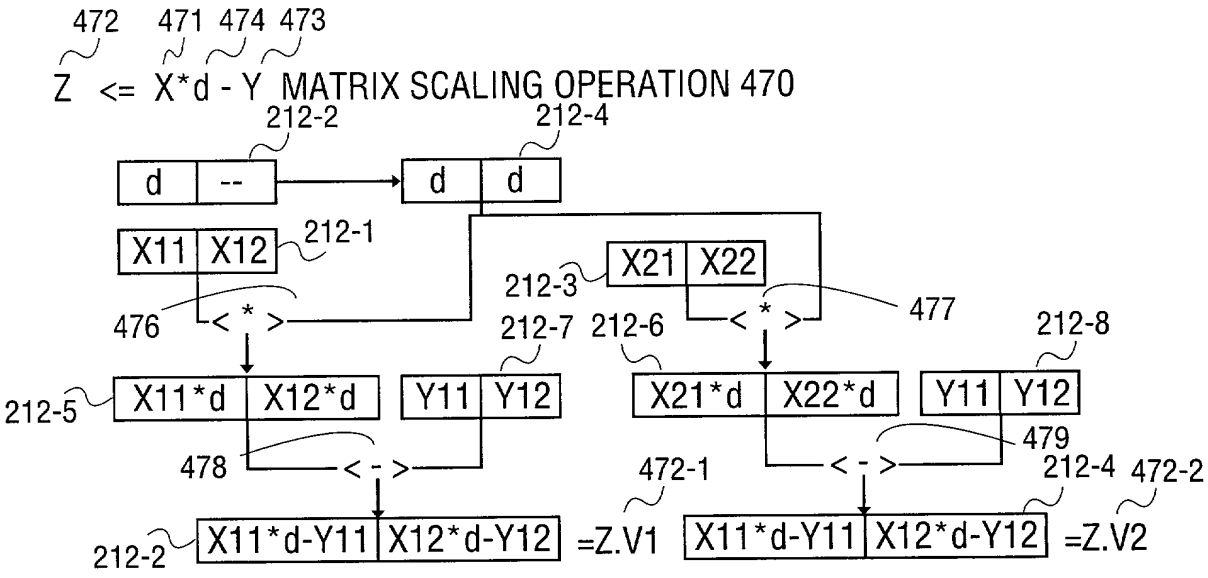

472 471 474 473
Z <= X*d - Y MATRIX SCALING OPERATION 470
212-2
212-4
d --
d d
X11 X12
212-1
212-3
X21 X22
476
< * >
477
212-7
212-6
212-8
212-5
X11*d X12*d
Y11 Y12
X21*d X22*d
Y11 Y12
478
< - >
479
472-1
212-4
472-2
212-2
X11*d-Y11 X12*d-Y12
=Z.V1
X11*d-Y11 X12*d-Y12
=Z.V2

FIG. 9

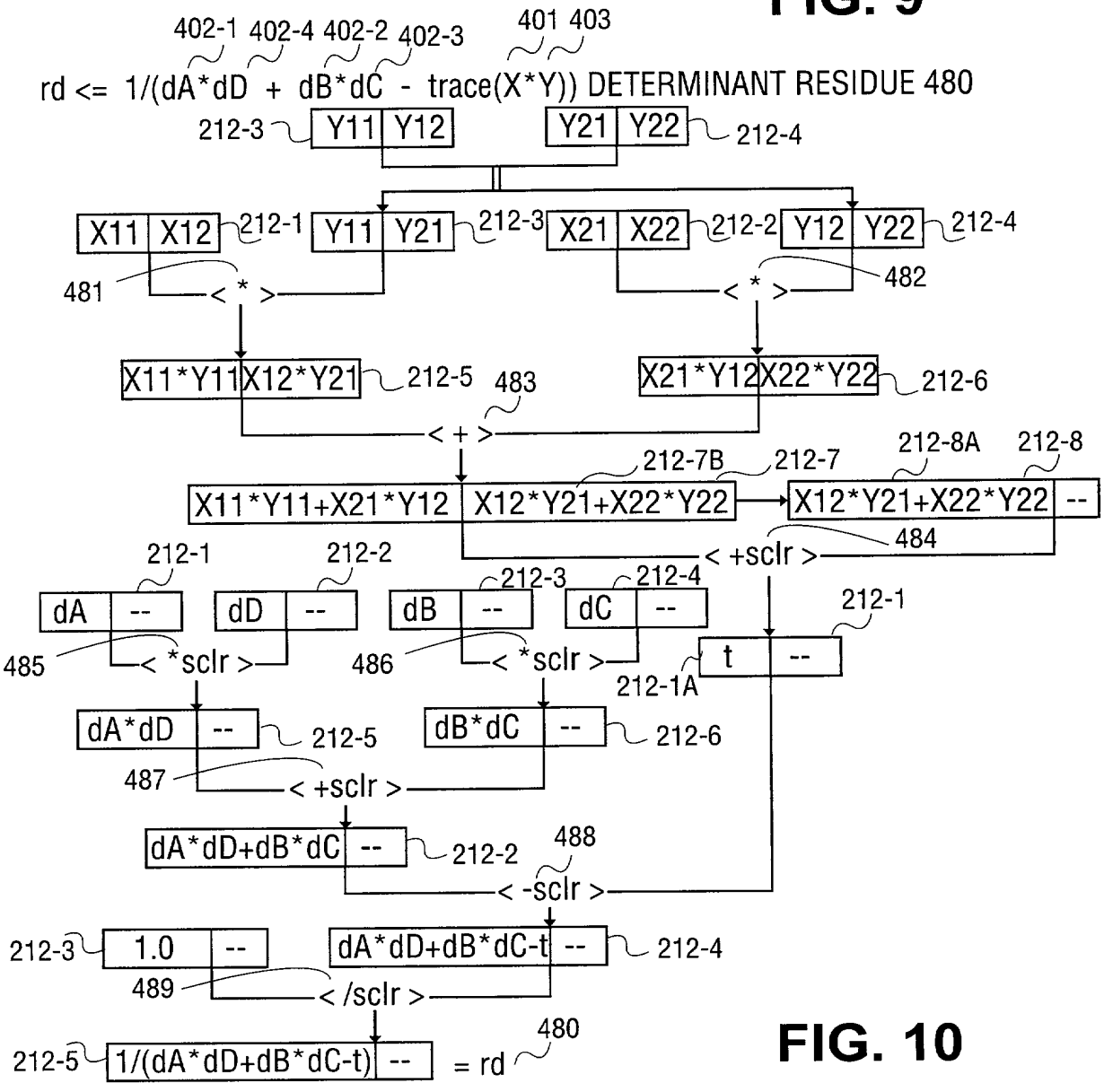

402-1 402-4 402-2 402-3
401 403
rd <= 1/(dA*dD + dB*dC - trace(X*Y)) DETERMINANT RESIDUE 480
212-3
Y11 Y12
Y21 Y22
212-4
X11 X12
212-1
Y11 Y21
212-3
X21 X22
212-2
Y12 Y22
212-4
481
< * >
482
X11*Y11 X12*Y21
212-5
483
X21*Y12 X22*Y22
212-6
< + >
212-7B
212-7
212-8A
212-8
X11*Y11+X21*Y12
X12*Y21+X22*Y22
X12*Y21+X22*Y22 --
484
< +sclr >
212-1
212-2
212-3
212-4
dA --
dD --
dB --
dC --
212-1
485
< *sclr >
486
< *sclr >
t --
212-1A
dA*dD --
212-5
dB*dC --
212-6
487
< +sclr >
dA*dD+dB*dC --
212-2
488
< -sclr >
212-3
1.0 --
dA*dD+dB*dC-t --
212-4
489
< /sclr >
212-5
1/(dA*dD+dB*dC-t) --
= rd
480

FIG. 10

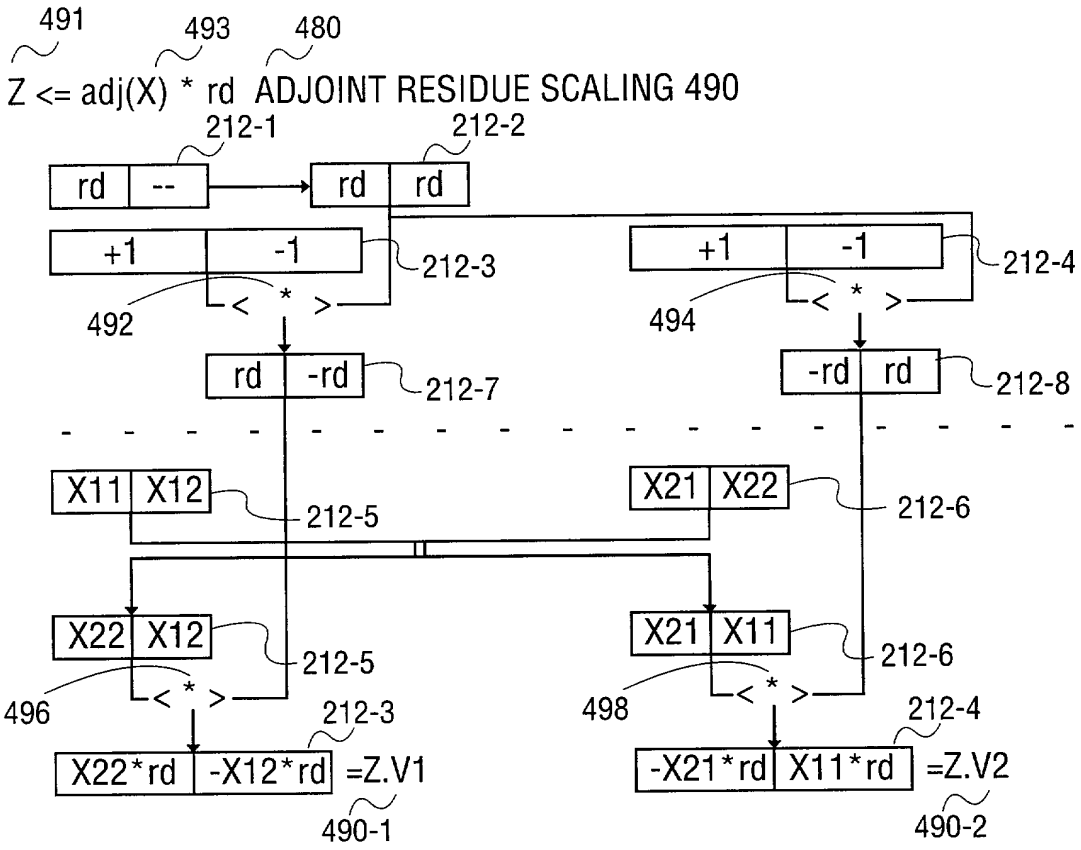

491
493
480
Z <= adj(X) * rd ADJOINT RESIDUE SCALING 490
212-1
212-2
rd
--
rd
rd
+1
-1
212-3
492
< * >
+1
-1
212-4
494
< * >
rd
-rd
212-7
-rd
rd
212-8
X11
X12
212-5
X21
X22
212-6
X22
X12
212-5
496
< * >
212-3
X22*rd
-X12*rd
=Z.V1
490-1
X21
X11
212-6
498
< * >
212-4
-X21*rd
X11*rd
=Z.V2
490-2

FIG. 11

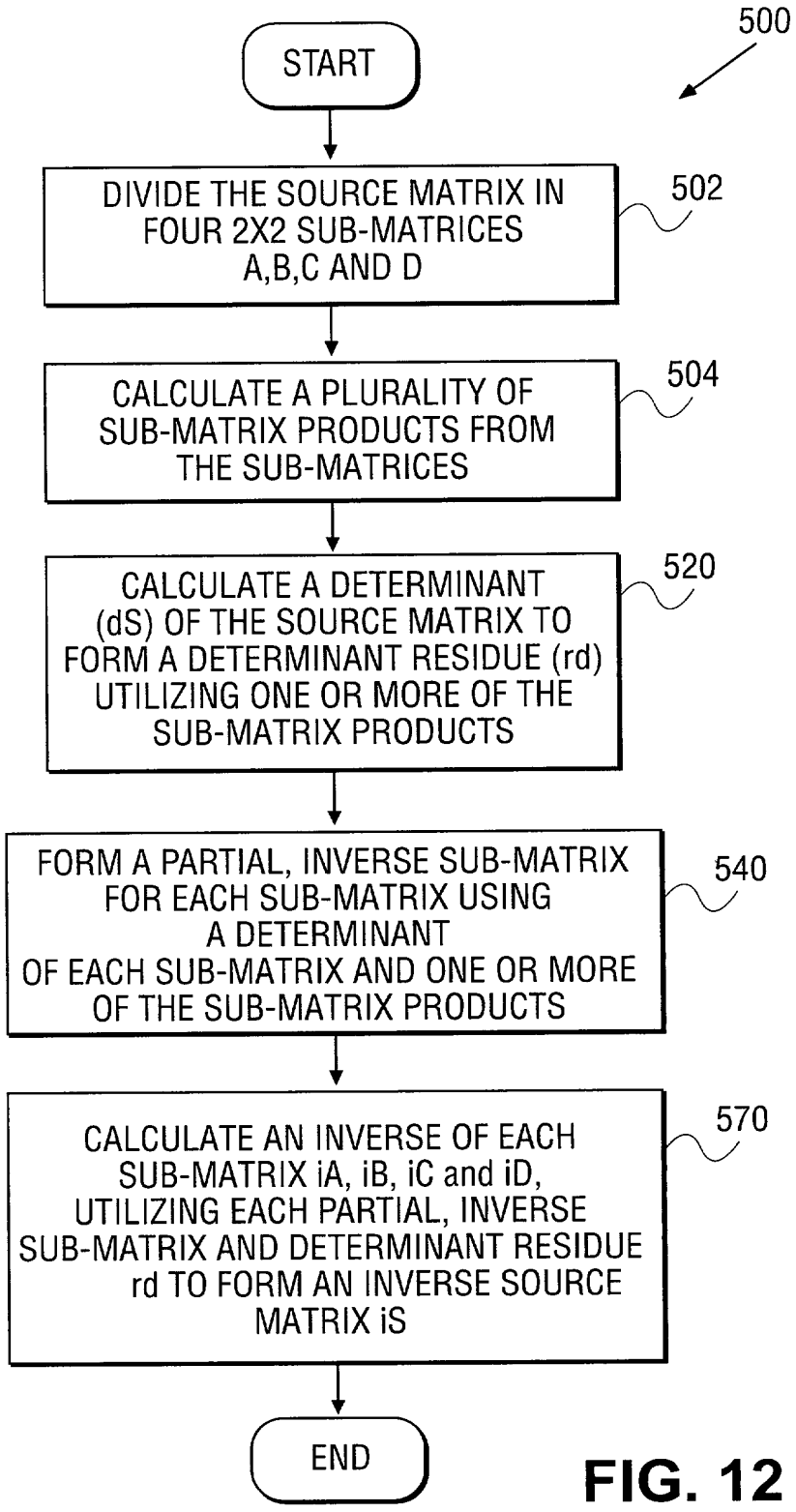

500
START
DIVIDE THE SOURCE MATRIX IN FOUR 2X2 SUB-MATRICES A,B,C AND D
502
CALCULATE A PLURALITY OF SUB-MATRIX PRODUCTS FROM THE SUB-MATRICES
504
CALCULATE A DETERMINANT (dS) OF THE SOURCE MATRIX TO FORM A DETERMINANT RESIDUE (rd) UTILIZING ONE OR MORE OF THE SUB-MATRIX PRODUCTS
520
FORM A PARTIAL, INVERSE SUB-MATRIX FOR EACH SUB-MATRIX USING A DETERMINANT OF EACH SUB-MATRIX AND ONE OR MORE OF THE SUB-MATRIX PRODUCTS
540
CALCULATE AN INVERSE OF EACH SUB-MATRIX iA, iB, iC and iD, UTILIZING EACH PARTIAL, INVERSE SUB-MATRIX AND DETERMINANT RESIDUE rd TO FORM AN INVERSE SOURCE MATRIX iS
570
END

FIG. 12

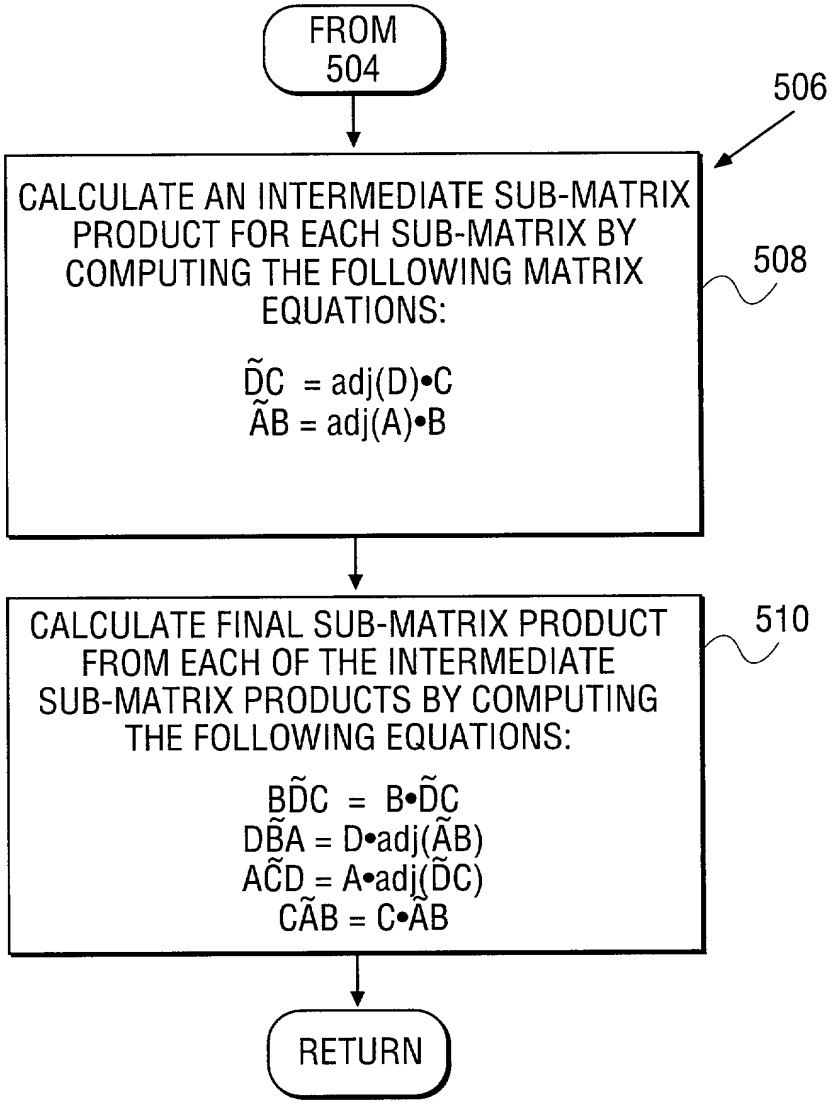

FROM 504
506
CALCULATE AN INTERMEDIATE SUB-MATRIX PRODUCT FOR EACH SUB-MATRIX BY COMPUTING THE FOLLOWING MATRIX EQUATIONS:
$\tilde{D}C = adj(D) \bullet C$
$\tilde{A}B = adj(A) \bullet B$
508
CALCULATE FINAL SUB-MATRIX PRODUCT FROM EACH OF THE INTERMEDIATE SUB-MATRIX PRODUCTS BY COMPUTING THE FOLLOWING EQUATIONS:
$B\tilde{D}C = B \bullet \tilde{D}C$
$D\tilde{B}A = D \bullet adj(\tilde{A}B)$
$A\tilde{C}D = A \bullet adj(\tilde{D}C)$
$C\tilde{A}B = C \bullet \tilde{A}B$
510
RETURN

FIG. 13

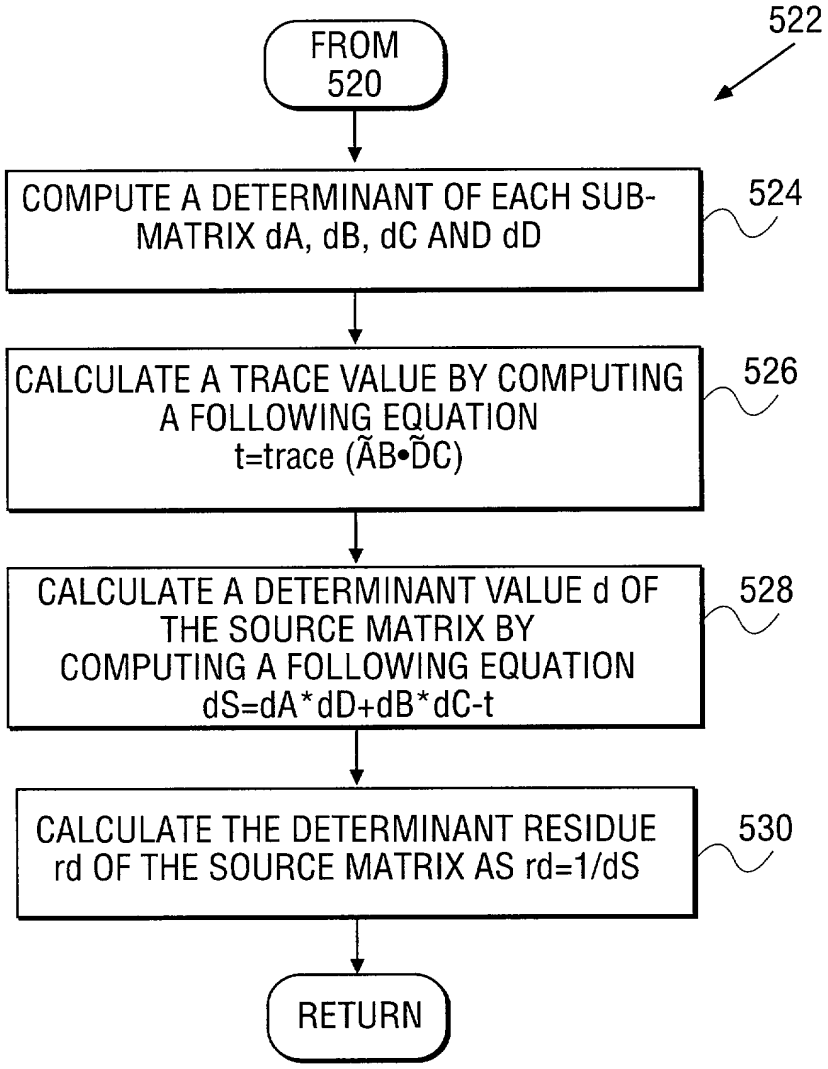

522
FROM 520
COMPUTE A DETERMINANT OF EACH SUB-MATRIX dA, dB, dC AND dD
524
CALCULATE A TRACE VALUE BY COMPUTING A FOLLOWING EQUATION t=trace (ÃB•D̃C)
526
CALCULATE A DETERMINANT VALUE d OF THE SOURCE MATRIX BY COMPUTING A FOLLOWING EQUATION dS=dA*dD+dB*dC-t
528
CALCULATE THE DETERMINANT RESIDUE rd OF THE SOURCE MATRIX AS rd=1/dS
530
RETURN

FIG. 14

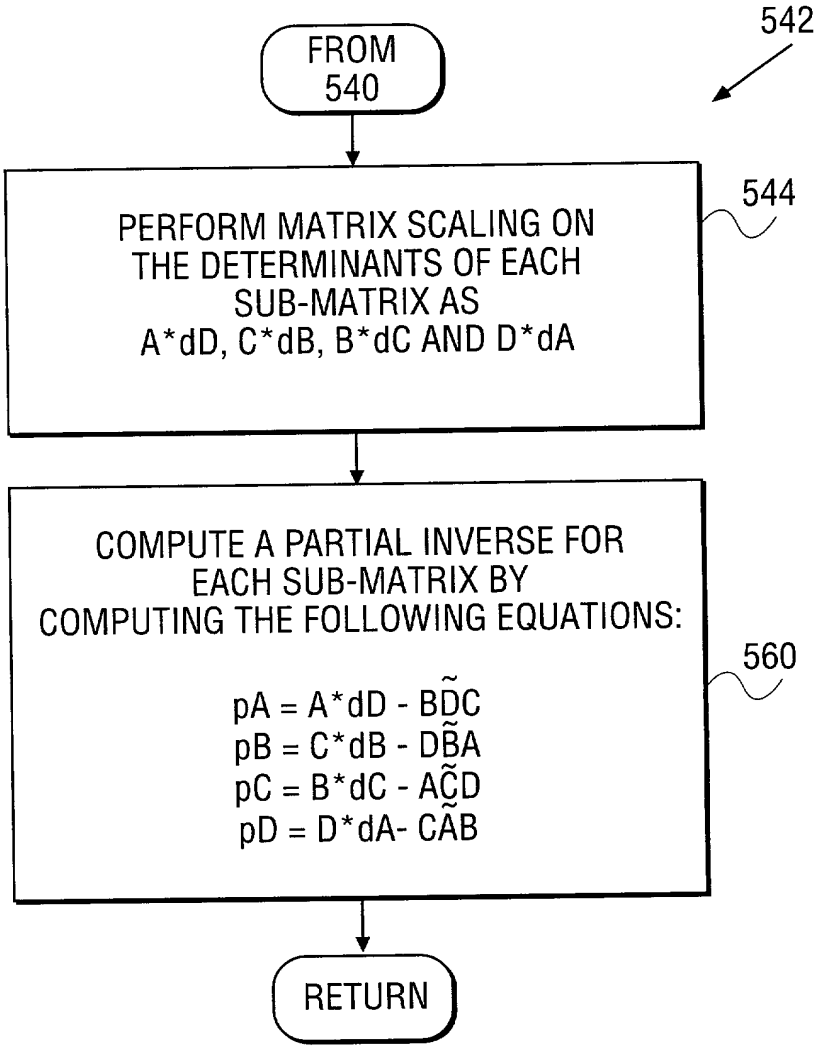

542
FROM 540
PERFORM MATRIX SCALING ON THE DETERMINANTS OF EACH SUB-MATRIX AS A*dD, C*dB, B*dC AND D*dA
544
COMPUTE A PARTIAL INVERSE FOR EACH SUB-MATRIX BY COMPUTING THE FOLLOWING EQUATIONS:
pA = A*dD - BD̃C
pB = C*dB - DB̃A
pC = B*dC - AC̃D
pD = D*dA- CÃB
560
RETURN

FIG. 15

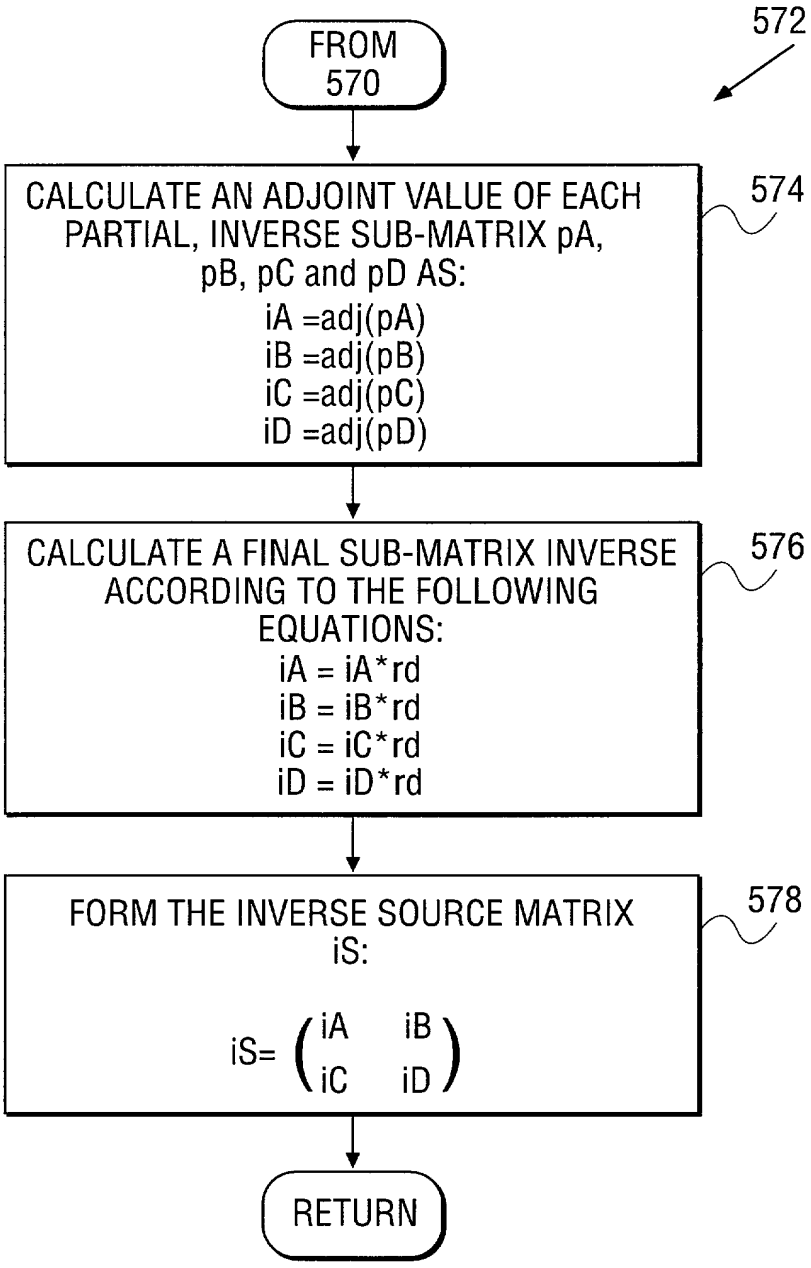

572
FROM 570
CALCULATE AN ADJOINT VALUE OF EACH PARTIAL, INVERSE SUB-MATRIX pA, pB, pC and pD AS:
iA =adj(pA)
iB =adj(pB)
iC =adj(pC)
iD =adj(pD)
574
CALCULATE A FINAL SUB-MATRIX INVERSE ACCORDING TO THE FOLLOWING EQUATIONS:
iA = iA*rd
iB = iB*rd
iC = iC*rd
iD = iD*rd
576
FORM THE INVERSE SOURCE MATRIX iS:
iS= (iA iB / iC iD)
578
RETURN

FIG. 16

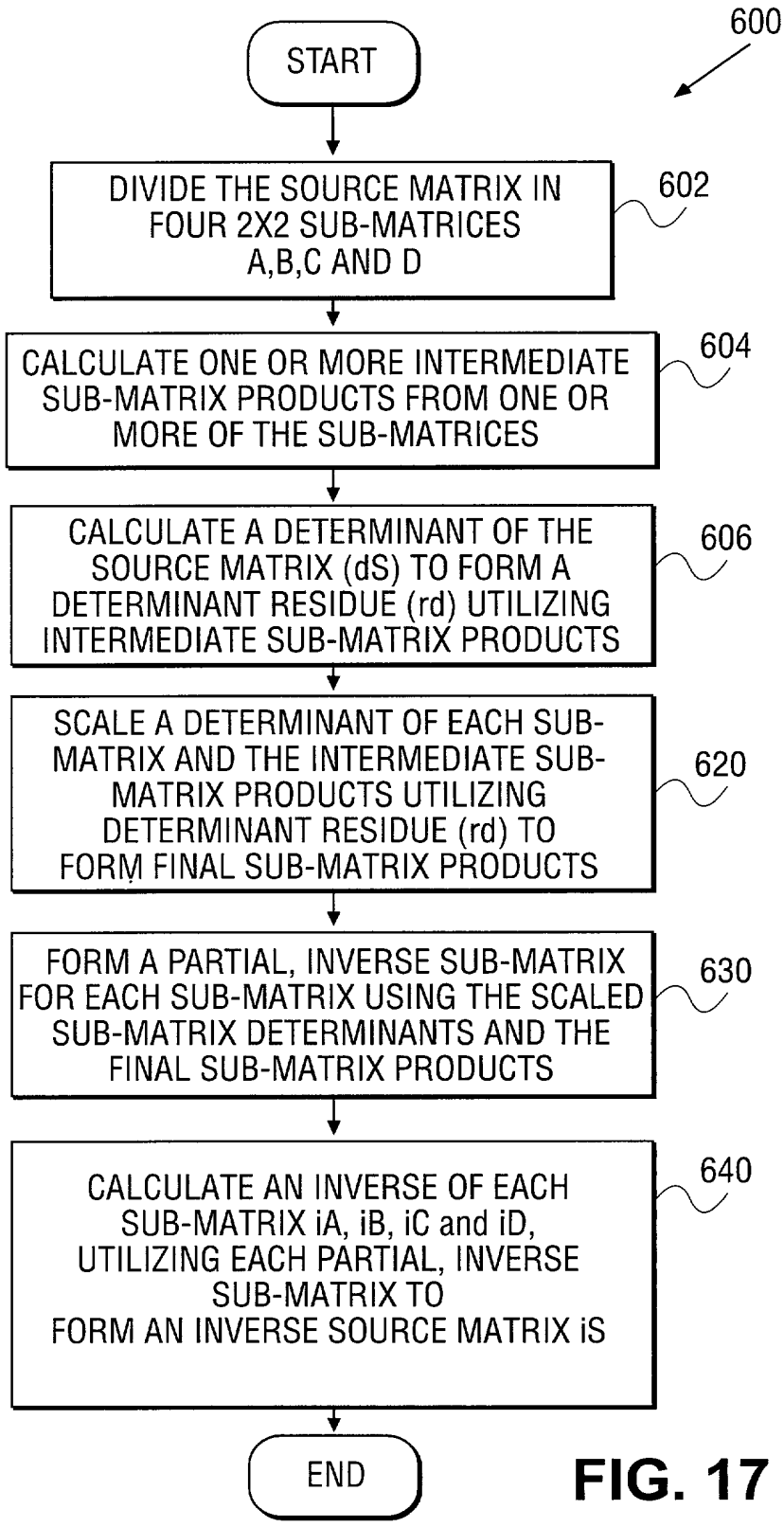

600
START
DIVIDE THE SOURCE MATRIX IN FOUR 2X2 SUB-MATRICES A,B,C AND D
602
CALCULATE ONE OR MORE INTERMEDIATE SUB-MATRIX PRODUCTS FROM ONE OR MORE OF THE SUB-MATRICES
604
CALCULATE A DETERMINANT OF THE SOURCE MATRIX (dS) TO FORM A DETERMINANT RESIDUE (rd) UTILIZING INTERMEDIATE SUB-MATRIX PRODUCTS
606
SCALE A DETERMINANT OF EACH SUB-MATRIX AND THE INTERMEDIATE SUB-MATRIX PRODUCTS UTILIZING DETERMINANT RESIDUE (rd) TO FORM FINAL SUB-MATRIX PRODUCTS
620
FORM A PARTIAL, INVERSE SUB-MATRIX FOR EACH SUB-MATRIX USING THE SCALED SUB-MATRIX DETERMINANTS AND THE FINAL SUB-MATRIX PRODUCTS
630
CALCULATE AN INVERSE OF EACH SUB-MATRIX iA, iB, iC and iD, UTILIZING EACH PARTIAL, INVERSE SUB-MATRIX TO FORM AN INVERSE SOURCE MATRIX iS
640
END

FIG. 17

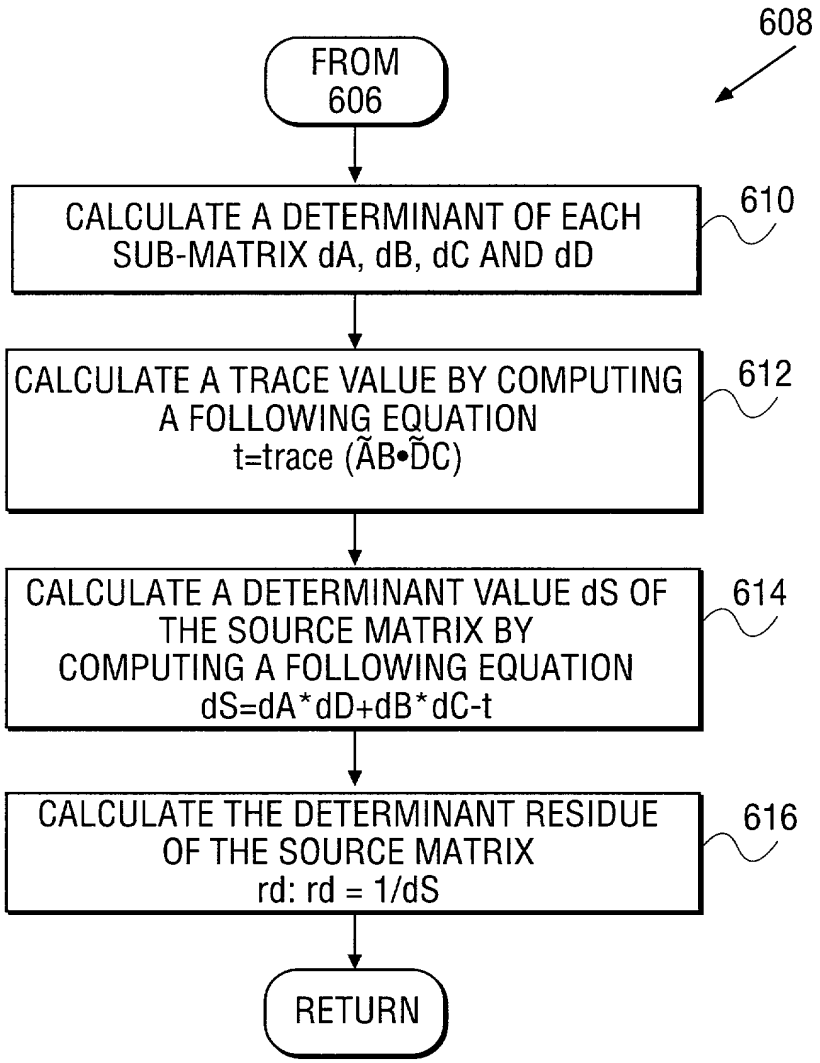

608
FROM 606
CALCULATE A DETERMINANT OF EACH SUB-MATRIX dA, dB, dC AND dD
610
CALCULATE A TRACE VALUE BY COMPUTING A FOLLOWING EQUATION t=trace (ÃB•D̃C)
612
CALCULATE A DETERMINANT VALUE dS OF THE SOURCE MATRIX BY COMPUTING A FOLLOWING EQUATION dS=dA*dD+dB*dC-t
614
CALCULATE THE DETERMINANT RESIDUE OF THE SOURCE MATRIX rd: rd = 1/dS
616
RETURN

FIG. 18

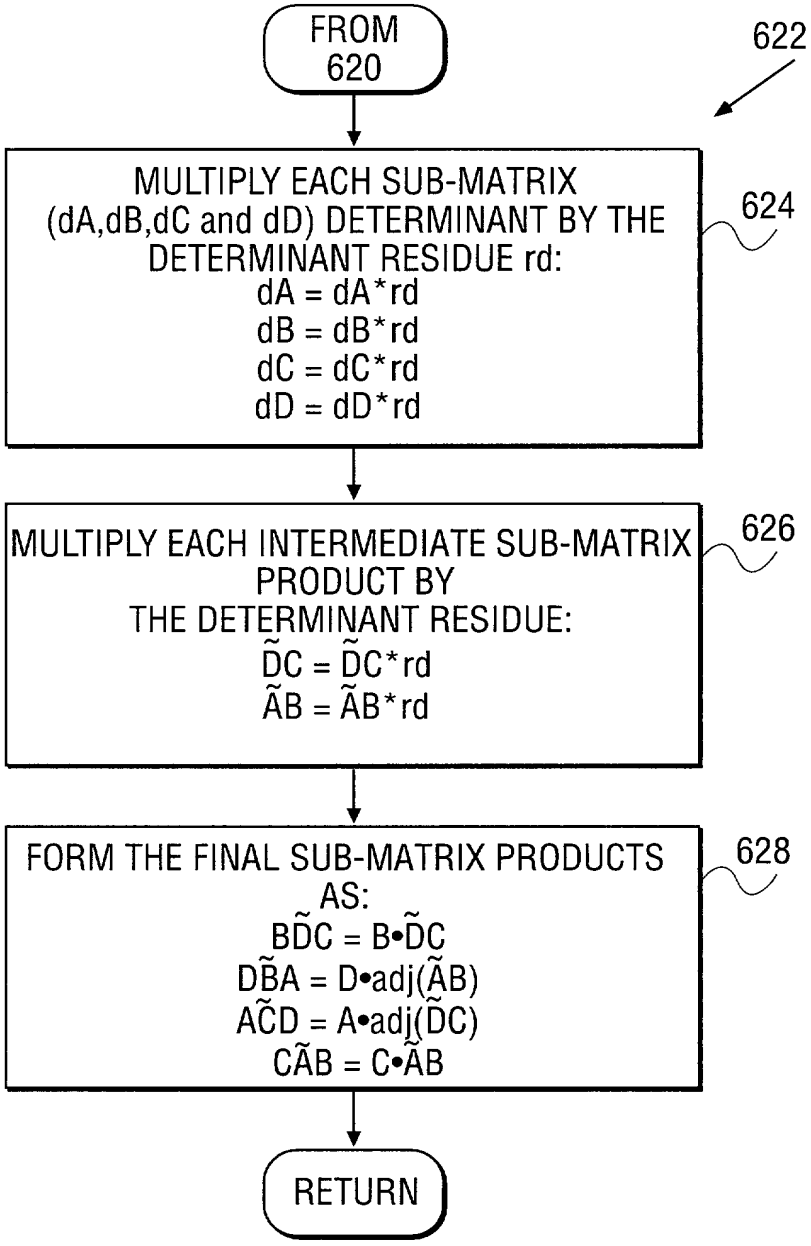

FROM 620
622
MULTIPLY EACH SUB-MATRIX (dA,dB,dC and dD) DETERMINANT BY THE DETERMINANT RESIDUE rd:
dA = dA*rd
dB = dB*rd
dC = dC*rd
dD = dD*rd
624
MULTIPLY EACH INTERMEDIATE SUB-MATRIX PRODUCT BY THE DETERMINANT RESIDUE:
D̃C = D̃C*rd
ÃB = ÃB*rd
626
FORM THE FINAL SUB-MATRIX PRODUCTS AS:
BD̃C = B•D̃C
DB̃A = D•adj(ÃB)
AC̃D = A•adj(D̃C)
CÃB = C•ÃB
628
RETURN

FIG. 19

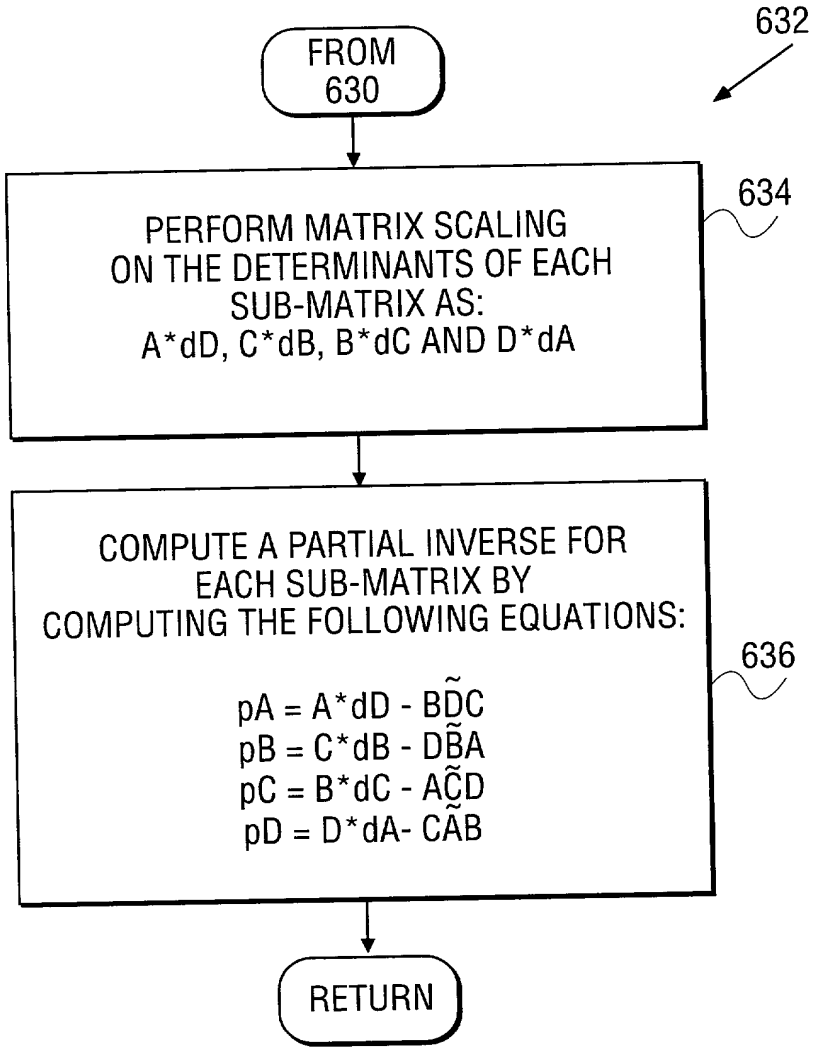

632
FROM 630
PERFORM MATRIX SCALING ON THE DETERMINANTS OF EACH SUB-MATRIX AS: A*dD, C*dB, B*dC AND D*dA
634
COMPUTE A PARTIAL INVERSE FOR EACH SUB-MATRIX BY COMPUTING THE FOLLOWING EQUATIONS:
pA = A*dD - BD̃C
pB = C*dB - DB̃A
pC = B*dC - AC̃D
pD = D*dA- CÃB
636
RETURN

FIG. 20

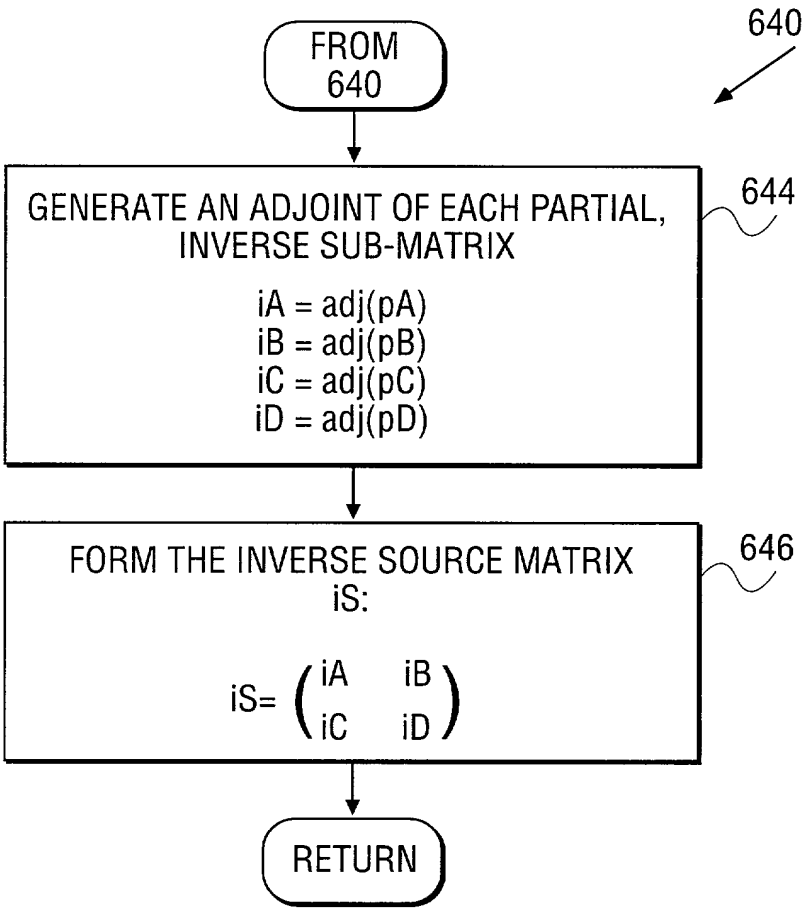

640
FROM 640
GENERATE AN ADJOINT OF EACH PARTIAL, INVERSE SUB-MATRIX
644
iA = adj(pA)
iB = adj(pB)
iC = adj(pC)
iD = adj(pD)
FORM THE INVERSE SOURCE MATRIX iS:
646
iS= (iA iB / iC iD)
RETURN

FIG. 21